

54. 29. (New) An image display system comprising a pair of image display systems according to claim 26 for a right eye and a left eye of an observer.

D2 55. 30. (New) An image display system comprising a pair of image display systems according to claim 27 for a right eye and a left eye of an observer.--

REMARKS

Applicants request favorable reconsideration and allowance of the present application in view of the foregoing amendments and the following remarks.

Claims 1-10 and 26-30 are pending in the present application. Claim 1 is the sole independent claim.

Claims 11-23 and 25 have been cancelled without prejudice or disclaimer. Claims 1-10 have been amended. Claims 26-30 are newly-presented. Support for the amendments to Claim 1 can be found at least at, for example, page 21, lines 9-11, page 23, lines 23-26 of the specification as originally filed. Support for the amendments to Claim 4 can be found at least at, for example, Figure 3 of Applicants' disclosure. Support for newly-presented Claims 26-30 can be found at least at, for example, Figures 2 and 3 of Applicants' disclosure. No new matter has been added.

Pending Claims 1-10 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,719,701 (Sudo). The rejection of Claims 1-10 is respectfully traversed.

In one aspect of the invention, independent Claim 1 recites, inter alia,:

An image display apparatus for providing multiple parallax images to a single eye of observer . . . wherein a different parallax image,

a portion of an optical path of which is overlapped, is presented to an observer through no less than two different portions of the exit pupil in a predetermined time, and wherein the parallax image is recognized at a position farther than said display optical system.

However, Applicants respectfully submit that neither Sudo nor U.S. Patent No. 6,233,003 (Ono) (asserted against certain of the cancelled claims) discloses or suggests at least the above-discussed claimed features as recited, inter alia, in independent Claim 1. Thus, these citations do not anticipate this claim.

The claimed invention is directed to a technique for displaying a “super multi-view” with a virtual view. As explained at, for example, page 23, line 23 through page 28, line 17 of the specification, by presenting a plurality of parallax images to a single eye and dimensioning the exit pupils of the parallax images so that they are equal to or smaller than those of the pupil of the observer, it is possible to view stereoscopic images in a “super multi-view” region. Broadly, these techniques are known. See, e.g., “Ocular Accommodation by Super Multi-View Stereogram and 45-View Stereoscopic Display”, Y. Kajiki, et al., Proc. of the Third International Display Workshop (IDW ‘96), vol. 2, 1996.


When using virtual images, the exit pupils of the display optical system can be located in the vicinity of the pupil of the observer. As a result, the number of divisions of the exit pupils (number of the parallax images) of the display optical system can be reduced. Further, when used with, for example, a head mounted display, the exit pupil of the display optical system can be fixed at a position of the pupil of the observer so that the number of the parallax images to be presented can be further reduced. Consequently, a stereoscopic view can be made possible with high fidelity at the “super multi-view” region even in a display device having a relatively slow display speed. In addition, the number of the parallax images to be prepared can be reduced.

For the foregoing reasons, Applicants submit that the independent claim patentably defines the present application over the citations of record. Further, the dependent claims should also be allowable for the same reasons as the base claim from which they depend and further due to the additional features that they recite. Separate and individual consideration of each of the dependent claims is respectfully requested.

Applicants submit that this Amendment After Final Rejection clearly places the subject application in condition for allowance. This Amendment was not earlier presented because Applicant believed that the prior Amendment placed the subject application in condition for allowance. Accordingly, entry of the instant Amendment as an earnest attempt to advance prosecution and reduce the number of issues is requested under 37 C.F.R. § 1.116.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below listed address.

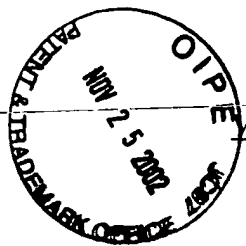
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VERSION WITH MARKINGS TO SHOW CHANGES MADE TO THE CLAIMS

1. (Amended) An image display apparatus for providing multiple
parallax images to a single eye of observer, said apparatus comprising:
image display means for displaying a parallax image;[,]
a display optical system for guiding light from said [the] image display
means to a position of an exit pupil; and[,]
[exit pupil] control means for presenting a given image to a given portion of
an [spatially and temporally dividing the] exit pupil, [into a plurality of areas and
controlling a passing beam to each other, and image switching control means for
controlling switching between parallax images of the image display means in
correspondence to passing beams through the respective areas of the exit pupil, wherein a
plurality of parallax images are perceived by a single eye of an observer]
wherein a different parallax image, a portion of an optical path of which is
overlapped, is presented to an observer through no less than two different portions of the
exit pupil in a predetermined time, and wherein the parallax image is recognized at a
position farther than said display optical system.

2. (Amended) An image display apparatus according to claim 1,
further comprising:
[image display means for displaying a parallax image, a display optical
system for guiding light from the image display means to a position of an exit pupil, and

~~exit pupil control means for controlling a position or a size of the exit pupil in a direction perpendicular to the optical axis, dividing the exit pupil into a plurality of areas, and successively generating the plurality of divided areas of the exit pupil without duplication, wherein the image display means successively displays corresponding parallax images according to beams passing the respective areas thus generated]~~

~~exit pupil control means for dividing the exit pupil into a plurality of areas,~~
~~wherein said control means controls said image display means and said exit pupil control means.~~

3. (Amended) The image display apparatus according to Claim 1 [or 2], further comprising

[wherein said exit pupil has a diameter two to five times larger than a diameter of the pupil of the observer using said image display apparatus]

image display illumination means divided into a plurality of areas for dividing the exit pupil into a plurality of areas,

wherein said control means controls said image display means and said illumination means.

4. (Amended) An [The] image display apparatus [according to Claim 1 or 2, wherein any one of the plurality of areas in said exit pupil has a size not more than half a size of the pupil of the observer using said image display apparatus] comprising a pair of image display apparatus of claim 2 or 3 for a right eye and a left eye of an observer.

5. (Amended) ~~The image display apparatus according to Claim [1 or]~~
~~2 or 3~~, said image display apparatus being mounted on the head of the observer, wherein
said exit pupil is fixed at the position of the pupil of the observer.

6. (Amended) The image display apparatus according to Claim [1 or]
~~2 or 3~~, wherein said exit pupil is divided into a plurality of areas only in the horizontal
direction.

7. (Amended) The image display apparatus according to Claim [1 or]
~~2 or 3~~, wherein said image display means comprises a transmissive spatial light modulator
and said exit pupil control means comprises a self-emissive spatial light modulator.

8. (Amended) The image display apparatus according to Claim [1 or]
2, wherein said image display means comprises a self-emissive spatial light modulator and
said exit pupil control means comprises a transmissive spatial light modulator.

9. (Amended) The image display apparatus according to Claim [1 or]
~~2 or 3~~, wherein each of said image display means and said exit pupil control means
comprises a transmissive spatial light modulator.

10. (Amended) The image display apparatus according to Claim [1 or]
2, wherein said exit pupil control means comprises a micro-mirror device.